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Guidelines For Automated Measurement System Applications

April 1986

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Guidelines For Automated Measurement System Applications

An application for such a system may be made in any form, but it should contain the following information:

It is recommended that applicants consider the following factors in their applications:

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GUIDELINES FOR AUTOMATED MEASUREMENT SYSTEM APPLICATIONS

Section 1 of this guide is intended to outline the requirements for automated measurement systems, such as supervisory, control and data acquisition (SCADA) systems. The use of individual flow computers or microprocessors is covered in Section 2 of this guide.

Removal of chart records that are required by section 14.070(1) of the Oil and Gas Conservation Regulations may be granted upon the approval of the application and a submission of acceptable comparative data between the automated system and conventional chart recordings. The automated system volumes shall be within 2 per cent of the calculated chart volume, on a daily basis, for 30 consecutive days.

An application for such a system may be made in two parts: Part 1 containing all the descriptive information about the system submitted prior to construction and Part 2 containing the chart comparison data and a description of any changes from Part 1 that may have occurred.

It is recommended that operators considering the installation of any type of automated measurement system first contact the Production Section of the Board's Development Department to discuss the requirements in this area.

Section 1 of this guide is intended to provide the user with a general understanding of the system and its components. The user should read this section carefully before attempting to use the system. The user should also read the user manual for the system, which is included with the system.

Section 2 of this guide is intended to provide the user with a general understanding of the system and its components. The user should read this section carefully before attempting to use the system. The user should also read the user manual for the system, which is included with the system.

Section 3 of this guide is intended to provide the user with a general understanding of the system and its components. The user should read this section carefully before attempting to use the system. The user should also read the user manual for the system, which is included with the system.

Section 4 of this guide is intended to provide the user with a general understanding of the system and its components. The user should read this section carefully before attempting to use the system. The user should also read the user manual for the system, which is included with the system.

Section 5 of this guide is intended to provide the user with a general understanding of the system and its components. The user should read this section carefully before attempting to use the system. The user should also read the user manual for the system, which is included with the system.

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1 AUTOMATED MEASUREMENT SYSTEM APPLICATIONS

Automated measurement systems shall have the capability of performing the following:

- o Calculating Gas and Liquid Flow Rates Accurately in Accordance with Approved Standards, such as
 - . AGA #3 for gas orifice meters
 - . AGA #7 for gas turbine meters
 - . API for liquid turbine meters
 - . Beck, Miller, Spink for liquid measurement
 - . Appropriate corrections for supercompressibility
 - . Other approved standards, where applicable
- o Keeping Records of All Calculated Flows
- o Having Provisions for Confirming the Calculations of All Flow Volumes Recorded

An application for approval of an automated measurement system shall include information in the following areas:

- o General Description
- o Hardware Description
- o Software Description
- o Report Generation

A discussion of the information required for each of these areas is presented in this guide.

GENERAL DESCRIPTION

A general description of the production facility and automated measurement system shall be presented covering the following areas:

- o a brief description of the production facility, including facility name, location, field name, and wells
- o a discussion of the automated measurement system
- o a simplified flow diagram of the production facility indicating all measurement points, with those points tied into the automated system clearly identified

HARDWARE DESCRIPTION

This section shall contain descriptions of the various elements involved in the measurement system as follows:

- o Master Terminal Unit (MTU)
- o Remote Terminal Units (RTU)
- o data storage capabilities of MTU and RTU
- o communications
- o type and make of end devices with the accuracy capabilities indicated
- o a detailed description of calibration procedures including copies of calibration reports to be used
- o power supply: type, alternates, and reliability to MTU and RTUs

SOFTWARE DESCRIPTION

This section will discuss the system software used for flow calculation and data storage as follows:

- o function of system
 - MTU Functions
 - RTU Functions
- o system access security - describe the various levels of security and indicate who has access to which levels
- o data transmission validity checking
- o data storage
 - memory protection
 - stored at RTU or MTU
 - back-up storage (disk, tape or other)
- o measurement calculations, including
 - integration frequency
 - calculation frequency
 - details of calculations
 - sample calculation
 - indicate fixed and variable factors
 - metric conversion factors
 - indicate where calculations are performed, RTU or MTU
- o discuss failures of RTU, MTU, or communications with regard to data loss and shutdown of production facility
- o discuss measurement-related alarms such as
 - high/low differential pressure
 - over range of end devices
- o identification of data which can be modified or edited and how this is indicated on the printed reports

REPORT GENERATION

This section is to provide a brief description of each report generated by the system with a sample of each report included. All reports must be kept for a period of 1 year on hard copy, tape, or disk. The format is optional but must contain the following information:

Daily Production Report

This will be a report of each measurement point, printed at the same time each day, giving the following information, if applicable:

- o meter identification
- o accumulated daily flow with indicating flags for
 - estimated flows made by the system or by the operator
 - alarms that have occurred for high/low differential pressure or over ranging of end devices
- o hours on production
- o an instantaneous flow rate, static pressure, differential pressure and flowing temperature taken at the same time each day
- o meter correction factors
- o gas equivalent factors
- o water/gas ratios
- o gas/oil ratios
- o an indication of flow parameter changes such as
 - orifice change
 - gas/liquid analysis update
 - any other changes to data base used in the flow calculation
 - such changes will cause a meter report to be generated

Meter Report

This will be a report of all information used to calculate a flow volume for each meter. This report must be available on request and is to be printed automatically whenever any of the flow parameters are changed. The following information is to be provided for orifice measurement:

- o meter identification
- o instantaneous flow rate
- o static pressure (P_f)
- o differential pressure (h_w)
- o flowing temperature (T_f)
- o line size
- o orifice size
- o atmospheric pressure
- o basic orifice factor (F_b)
- o real gas relative density factor (F_{gr})
- o flowing temperature factor (F_{t_f})
- o Reynolds Number factor (F_r)
- o expansion factor (Y)
- o pressure base factor (F_{pb})
- o temperature base factor (F_{tb})
- o supercompressibility factor (F_{pv})
- o any other factors used (F_a , F_m , F_l)
- o orifice flow constant (C')
- o metric conversion factor
- o gas and/or liquid analyses and analysis date
- o relative density

Other types of measurement devices are to be identified and have all factors reported.

Alarm Report

This will be a report of the alarms that may have an effect on the measurement accuracy of the system. The report may be printed daily or as a weekly or monthly summary. The time of each alarm condition and the time of clearing of each alarm must be recorded. Alarms are required for the following:

- o Master Terminal Unit failures
- o Remote Terminal Unit failures
- o communication failures
- o low power warning
- o changes to data base
- o high/low differential pressure
- o over range values

Monthly Production Report

This will be a report for the entire system giving each metering point. The report is optional but, if generated, is to contain the following information, if applicable:

- o monthly cumulative flow at each measurement point
- o total hours on production
- o maximum daily volume for each gas well
- o test date for water production and water/gas ratio
- o gas/oil ratio
- o all estimated volumes used in preparing Board S-reports with explanation
- o metering differences, percentage metering difference, and/or proration factors for the system

2 GUIDELINES FOR FLOW COMPUTER APPLICATIONS

This section of the guide is for an application for individual flow computers, flow totalisers, or microprocessors. For ease of discussion these devices are referred to as flow computers and are divided into two categories, programmable and non-programmable.

(a) Programmable Flow Computers

These computers may be programmed by the user to perform a number of functions including flow volume calculations. As these computers may be uniquely programmed, an application for each installation must be submitted for approval. This application is to be made in accordance with the requirements outlined in this guide.

(b) Non-programmable Flow Computers

These computers are available with preprogrammed functions and flow volume calculations. Such computers are acceptable provided that the following information is submitted to the Board for each installation:

- o make and model of flow computer
- o make and type of end devices with the accuracy capabilities indicated
- o type of power supply
- o description of how flow volumes will be transcribed from the flow computer
- o brief description of the proposed metering installation
 - metering location
 - physical location of flow computer

Comparison data between the flow computer and conventional chart recorders may be required if the proposed use has a significant impact on measurement at the facility. This will be reviewed on a site-specific basis for each proposed installation.

It is recommended that operators considering installing flow computers first contact the Production Section of the Board's Development Department to discuss the application requirements for their particular installation.

Flow computers shall have the capability of performing the following:

- o Calculating Gas and Liquid Flow Rates Accurately in Accordance with Approved Standards, such as
 - . AGA #3 for gas orifice meters
 - . AGA #7 for gas turbine meters
 - . API for liquid turbine meters
 - . Beck, Miller, Spink for liquid measurement
 - . Appropriate corrections for supercompressibility
 - . Other approved standards, where applicable.
- o Keeping Records of All Calculated Flows
- o Having Provisions for Confirming the Calculations of All Flow Volumes Recorded

An application for approval of a flow computer shall include information in the following areas:

- o General Description
- o Hardware Description
- o Software Description
- o Records Keeping

A discussion of the information required for each of these areas is presented in this guide.

GENERAL DESCRIPTION

A general description of the proposed installation of the flow computer, with a simplified flow diagram of the production facility, indicating all measurement points, with points using the flow computer clearly identified.

HARDWARE DESCRIPTION

This section shall contain descriptions of the following:

- o the flow computer and its capabilities
- o data storage capabilities
- o type and make of end devices with the accuracy capabilities indicated
- o power supply: type, alternates, and reliability

SOFTWARE DESCRIPTION

This section will discuss the software used for flow calculation and data storage, as follows:

- o functions of the flow computer
- o access security
 - discuss security features
 - discuss security access to
 - . data base
 - . flow calculating program
- o data storage
 - mechanical counter
 - electronic memory
 - hard copy printout
- o measurement calculations, including
 - integration frequency
 - calculation frequency
 - details of calculations
 - sample calculation
 - indicate fixed and variable factors
 - metric conversion factors
- o flow computer failures with regard to data loss and effects on the production facility
- o measurement related alarms such as
 - high/low differential pressure
 - over range of end devices
- o identification of data which can be modified or edited and how this is indicated

RECORDS KEEPING

This section will discuss the accountability of the flow computer, as follows:

- o explain and provide examples of how volumes from the flow computer are transcribed for use by production accounting personnel, by one of the following:
 - the operator on a log sheet
 - an automatic printout
 - a manual printout
- o explain how the validity of calculated volumes is confirmed



Appendix A

This section will discuss the responsibility of the flow computer, as follows:

1. compute and provide samples of flow values from the flow computer are generated for use by production accounting personnel. It can be of the following:

- the operating log sheet
- an automatic printer
- a manual printer

2. provide for the validity of calculated results is essential.